

NOTES ON TWO GRASSHOPPER-WASPS.

BY L. G. CHANDLER.

In Red Cliffs (Vic.) there is a number of species of wasps, which prey upon grasshoppers and crickets. It is fortunate that horticulturists have these insect-friends, for bird-life yearly becomes scarcer in the district. Unchecked, the noxious insects would dominate the position, and leave ruin in their wake. Poison-sprays are of little use against a plague of grasshoppers. One might just as well attempt to stop a dust-storm in Sydney Road with a bucket of water! The use of such sprays, on a large scale, would ultimately cause the extermination of some species of our birds.

Thousands of insectivorous birds already have been poisoned: we can only guess at the number. I know that the growing scarcity of wild birds is becoming alarming, and the poison cart and poison spray are responsible for much of this loss. With the breeding haunts of birds also rapidly being destroyed, the useful insect will have to be depended upon to aid man in his fight against destructive insects, and it is well that we should know our friends.

In the majority of country homes, if a wasp of any species happened to find its way to the window, it would promptly be killed as a "beastly stinging creature." If the killer knew something of its life-history the story would, in most cases, be different. Through the same ignorance, thousands of useful creatures are destroyed annually, particularly birds, and the prosperity of our country is seriously handicapped.

In all new settlements some effort should be made by the Government to instil a knowledge of the friends and foes of the "man on the land" into the minds of new settlers. Lantern lectures are out of date, and it is time that the cinema was widely used in this connection. To take a moving picture of an insect would present difficulties, but they could be overcome by special methods.

I must admit that, even with an ordinary camera, I have found the photography of wasps very difficult. I have no photographs of the two species whose habits I propose briefly to outline; but often I have missed the opportunity to secure a photograph, in my eagerness to record some detail.

Chlorion claviger and *C. globosus* are found in this district; the former is rather a rare species, the latter, in some seasons, a common one. *C. claviger*, from my observations, confines its attention to a beautiful green grasshopper, a slim creature with long antennae. I have seen only a few specimens of this grasshopper, but the wasp has no difficulty in locating her game. *C. globosus* captures the more common types of grasshoppers or locusts, which, on summer days, add their instrumental music to the sounds of Nature.

Chlorion claviger differs, in many respects, from the paralyser of the common grasshoppers. She is no vagrant, content with a shallow burrow on the spot where she captures her prey. Her nursery is a palace beside the humble home that shelters the young of *C. globosus*. The burrow is five to six inches deep, and a number of cells radiate from the bottom. These cells are made as required, to accommodate the game. The main shaft, I believe, is excavated before the hunt begins. On each hunting trip the sloping entrance to the burrow is filled in with sand.

It is interesting to watch this wasp at the work of excavation. She works quickly, and as the grains of sand are brought to the surface in her front tarsi, she walks backwards for a distance of a few inches to several feet, and, with a jerk, throws the load behind her. Parasitical flies are savagely attacked; and, unlike some species of wasp which exhibit fear in the presence of ants, she has a system of her own to drive away the little marauders. She simply hovers above the ant, and when the latter has recovered sufficiently to escape from this miniature whirlwind, it makes off at top speed. I fancy if ants located the prey of *C. claviger*, there would be a lively battle over the booty.

On a dry, hot day, it is refreshing to witness the intense energy of this wasp. There is no "go-slow" policy with her. The confidence with which she puts undesirable insects to flight, and her healthy activities are an inspiration. I have not tested the effect of her sting, but her movements indicate that it might make one "hop." Though, truth to tell, the sting of many of these solitary wasps, causes only temporary inconvenience. It is intended for the scientific business of inflicting paralysis, and is not a defensive weapon like the sting of a bee.

As a matter of fact, with some species of wasp, I frequently stage the conflict, between wasp and prey, under a glass cover, on the palm of my hand. By this method I have been able to see the exact nerve-centres attacked, and on no occasion have I been stung.

C. claviger, having captured and paralysed her grasshopper, clasps it beneath her body, and flies to her burrow. Leaving the prey on the ground, a few yards away, she goes to the burrow and opens it. Then, if the cell below is not fully stocked, she places the grasshopper over the burrow-entrance, and goes below for an inspection. Ascending, she grasps the paralysed creature and drags it out of sight. Should the last cell be stocked, she excavates another before taking the grasshopper underground, and the work is quickly done.

I made several attempts to dig out burrows, but failed until I thought of a sure plan. A grass stem is inserted in the burrow, as a guide, and then the ground is dug away to a radius of from 18 inches to two feet from this centre, leaving the entrance to the shaft at the top of a pyramid. The pyramid is gradually reduced by a clasp-knife until the cells are reached. By this means, very little earth falls down the shaft.

When I successfully opened the first burrow of *C. claviger*, the sight that met my delighted eyes was well worth the hard work under a scorching sun. Three lateral cells radiated from the bottom of the burrow to a distance of about two inches each. One cell contained three grasshoppers tucked in side by side; the second, one grasshopper, and the third a well-developed grub, and the remnants of a feast. Lying there, in the brilliant sunshine, these dainty grasshoppers resembled tiny, green fishes, or miniature ornaments cut from delicately-tinted jade.*

The egg of this wasp is fastened to the thorax between the first pair of legs. It is curved, and about $5/32$ of an inch in length.

Chlorion globosus is a smaller wasp than his relative, *C. claviger*. On a warm summer day, when hordes of grasshoppers are a-wing—most of them advancing in the same direction—she has no difficulty in finding her prey. Running about until a grasshopper rises in front or flies

*It is possible that this particular species of grasshopper may be semi-insectivorous, but I know nothing about its habits.

overhead, like a flash she is in pursuit. Turn and twist as it may, the hopper cannot evade that tenacious pursuer; and wasp and game come to earth almost together. If the wasp is slow in coming to grips, the grasshopper might escape temporarily, but the relentless foe is quickly after it.

Sometimes, particularly when the hoppers are plentiful, the pursued one escapes. Among a number of flying forms, the wasp is confused and continues the chase after a different individual. The least hesitation on the part of the grasshopper when it alights, results in its capture. The Chlorion grasps its closed wings with her mandibles, and mounts its back—head to abdomen. Instead of plunging and jumping, as one might expect, the creature feebly attempts to ward off the blow from the sting by pushing forward with the basal portion of its jumping legs. The struggle sometimes continues for several minutes, and finally the wasp slips under the guard, or deliberately changes the assault to the opposite side, and the hopper is stung in the nerve-centre between the first pair of legs. This sting apparently paralyzes the front pair of legs, and on disturbing the wasp at this stage, I have seen her prey hop into the air and fly away.

The second point attacked is the base of the second left or right leg, according to the advantage of the moment. The victim is now helpless, for the last place stung paralyzes the jumping legs, and as the creature cannot hop into the air, its sails are useless. The gap between head and thorax is now forced open, and the wasp inserts her tongue. She must obtain nourishment by this action, for she continues the sucking for several minutes. Numerous species of wasps extract juices from their victims, but usually from the mouth. One wonders if they ever, on occasion, hunt solely for the purpose of refreshment. Faber certainly thought so in the case of a *Philanthus*—a bee-catcher.

In all the cases that have come under my notice, the instinct for the future of the race is strong, and the lapping of juices from the game is only a part of a sequence of actions. Indeed, who can say that it is not a very necessary part? It may be essential for the welfare of the wasp-grub that these juices be removed.

The paralysed grasshopper is left where it was captured, or carried a short distance and deposited in the open or on herbage a few inches off the ground. The wasp is not robust enough to fly with her game, so she

transports it by placing herself astride the body. The antennae she grasps in her mandibles, and the body is clasped with her front legs. She leaves the hopper close to the spot where the burrow will be dug, and she frequently visits and moves it a short distance, and nearer to her work, when engaged on the excavation. Soil that is firm enough to dig into, without a possibility of the walls collapsing, is suitable for her purpose.

The burrow is perpendicular, and about one and a half inches in depth, and a cell to contain the single head of game runs off at an angle at the bottom. Such a shallow shaft is quickly dug, and the shaft and cell to receive the grasshopper are ready within fifteen minutes to half-an-hour. Some wasps work feverishly; others linger over the job, and take spells for the purpose of grooming and sunning themselves.

When the cell is ready, she carries the hopper to the entrance, and, like *C. claviger*, goes below for a final inspection, comes up again, and hauls the creature below. A number of species of wasps never omit this last inspection of the burrow, and the observer may remove the game again and again, and they still persist. It is a curious action, and difficult to account for. It may be that the wasps are afraid of some enemy, or it is merely a final measurement, or perhaps done to give the last touches to the cell.

The egg is laid on the body at the base of either of the jumping legs. Within thirty seconds, as a rule, the wasp is on the surface, and at once begins to fill in the burrow. At intervals a small quantity of earth is scratched backwards with her fore feet into the hole, and pushed into position with her head.

After scratching the soil for several inches around the filled-in burrow, the wasp scatters a few small sticks and pebbles over the spot, and in eight or ten minutes all traces of the grasshopper's tomb has disappeared. In a few days the egg within will develop into a grub, and when the banquet of living flesh is finished the grub will pupate, and, in the course of time, emerge as a perfect insect. The industrious mother troubles no further about that particular offspring. While the wonderful transformation from egg to adult insect is taking place in that tiny cell, she has, unconcernedly, been capturing and paralyzing more grasshoppers, digging burrows for their reception, and seemingly unconsciously making the future welfare of her race assured.

The obvious anxiety of *C. globosus* for the safety of her paralysed prey, seems to show that she knows that enemies surround her. Chief among these are ants, parasitical flies, birds and lizards. I was, on one occasion, following a wasp with her grasshopper, when a bearded dragon made a rush at her. She had just time to drop her booty and escape. The lizard gulped down the dainty tit-bit, and, with a quaint waddle, returned to the shade of the verandah. His unexpected attack, although it created an amusing diversion, quite upset a plan that I was formulating.

Ants often cluster thickly upon the prey of the wasp, and after a few ineffective attempts to dislodge them, she leaves. If only a few ants are present, she succeeds sometimes, in retaining her prize. Should an ant wander into her partly excavated burrow, she will frequently abandon it, and begin upon another a few feet away.

Strange to say, although parasitical flies appear to annoy her by their presence, should one drop its larvae or eggs down the burrow, when she is engaged in laying an egg upon her grasshopper, the wasp, apparently, takes no notice of them, and the burrow is filled in with the parasites in the cell. As a result, the rations will be consumed, and her offspring destroyed.

Chlorion globosus is a smaller wasp than her relative, a check on the common grasshoppers or locusts. As stated previously, the green grasshopper of *C. claviger* may be semi-insectivorous. In any case, *C. claviger*, in this district at least, is a comparatively rare species, and therefore cannot be considered as an important economic factor.

EXCURSION TO BORONIA.

More than 30 members and friends attended this excursion. The weather was showery, but a pleasant three hours were spent in the bush. It was somewhat early in the year to see *Boronia* at its best, botanically; but we found a good deal to interest us. Almost 100 flowering plants (47 in flower) and ferns were recognised. Most conspicuous were the Acacias. Nine species native to the district, besides several others in cultivation, were seen in full flower. *Acacia myrtifolia* was specially fine.

We were not very fortunate with orchids. Five species only were found in flower, including *Caladenia Patersonii*, *C. praecox*, and *Acianthus caudatus*. Perhaps the most remarkable find was *Helichrysum obcordatum*, rather a rarity in this part of the country. *Pullenaea subumbellata* and *Epacris microphylla* were other notable plants seen in flower. A visit to the Boronia flower farm was intended, but time was lacking to complete this part of the programme. We were able to admire the flowery fields from the roadway.—DAVID J. PATON.